

### REMARKS

Suppose one were asked to fix the occasional error in a lengthy book in which each page containing an error had been marked. The first step would, of course, be to identify the marked pages. This would require inspecting each page. To the extent errors are few and far between, this would be inefficient, since most pages would be error-free.

A more efficient approach, particularly for cases in which errors are few and far between, is to also mark the first page of any *chapter* that contains at least one error. This would allow one to scan through the first pages of each chapter, rather than the individual pages of the book. One could then hone in on error-ridden chapters. This avoids having to inspect each page in the book. Instead, one inspects only the pages of each marked chapter.

The inventors have implemented a similar scheme for correcting errors in a data storage system. Instead of requiring the inspection of each individual "page" (i.e. inspecting each trackable entry 28, each of which shows whether a "page"/"data storage element" has an error), The inventors provide what amounts to a chapter-list (the data structure 32) containing an entry 42 for each "chapter" ("data storage unit").

Detection of an error on a page results in (assuming the error is the first such error detected) updating of the entry 42 corresponding to the chapter containing that page. Similarly, repairing the last error in a chapter results in updating the entry 42 corresponding to that chapter.

By providing what amounts to a chapter table showing whether a chapter contains an error, the inventors have provided a way to accelerate the process of locating errors to be repaired.

The two-level hierarchy of the disclosed implementation is expressly recited in claim 1 by explicitly defining *both* a "data storage unit" and a "data storage element." The data storage *unit* would be analogous to the chapters in the foregoing analogy, and the data storage *elements* would be analogous to the pages that make up each chapter. In the inventors' implementation,

one identifies a data storage *unit* of interest, and then proceeds to inspect only those data storage *elements* that belong that *unit*.

In particular, claim 1 recites:

“providing a data structure having an entry corresponding to said data storage unit, said entry including status information indicating whether at least one constituent data storage element of said data storage unit is in said first state”

Thus, the entries of the data structure correspond to the *units*, and not to the *elements*. Moreover, the entries of that data structure indicate whether at least one of the unit's constituent elements is in a first state. By way of analogy, the entries of the data structure would correspond to *chapters*, not to *pages*, and each element would indicate whether at least one page in the chapter contained an error.

## SECTION 102 REJECTION OF CLAIM 1

### ***Candelaria fails to teach “providing a data structure”***

*Candelaria* discloses a track information block that “has addresses for each record of a track that is in the cache.”<sup>1</sup> As best understood, the Office regards this track information block as being like the claimed “data structure.” The claimed “entry” of that data structure would then be an address of a particular record within the track.

Claim 1 recites “providing a data structure having an entry corresponding to said data storage unit.” It is therefore necessary to identify what the Office considers to be a “data storage unit.”

On page 2 of the office action, the Office states:

“The above lines simply state that there is a cylinder data storage system that includes ‘tracks’ which denote at least 2 constituent storage elements”

Based on the foregoing, the Office apparently regards claim 1's “data storage unit” as being a track.

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<sup>1</sup> *Candelaria*, col. 7, lines 15-28

However, if this is the case, then any correspondence between claim 1 and *Candelaria* immediately disintegrates. The entries of the TIB do not correspond to tracks, they correspond to the *records* that make up a track. At best, the TIB would include “an entry corresponding to” constituent records of a track and not the track itself. However, the claim does not recite “providing a data structure having an entry corresponding to said data storage *element*.” The claim recites “an entry corresponding to said data storage *unit*.”

The Office appears to be disregarding the distinction between the “data storage unit” and its constituent “data storage elements.” Applicant requests that the Office carefully consider this distinction.

***Candelaria fails to teach “updating said entry”***

Claim 1 recites the further limitation of

*“updating said entry following a change in state of at least one of said constituent data storage elements.”*

In connection with the updating step, the Office states, on page 3 of the office action, that

*“Column 7, lines 31-32 - State the following: ‘An update write modifies a record existing on a DASD’”*

Claim 1’s updating step refers to “updating *said* entry,” with the entry having been defined earlier as being part of the data structure (“providing a data structure having an entry”). Modifying a record on a DASD, as disclosed by the cited text, is not the same as updating an entry in the TIB. After all, this modified record is not even part of the TIB.

Claims 2-12 all depend on claim 1 and are therefore allowable for at least the same reasons as set forth above.

**SECTION 102 REJECTION OF CLAIM 13**

Claim 13 and its dependent claims 14-24 include limitations similar to those of claim 1 and its corresponding dependent claims. Accordingly, claims 13-24 are patentable for at least the same reasons.

In addition, Applicant wishes to point out that the channel program includes software for writing a track to a disk.<sup>2</sup> Thus, the channel program has nothing to do with the software recited in claim 13.

#### **SECTION 102 REJECTION OF CLAIM 25**

Claim 25 and its dependent claims include limitations similar to those of claim 1. Accordingly, these claims are patentable for at least the same reason.

#### **SECTION 102 REJECTION OF CLAIM 8 AND CLAIM 20**

In rejecting claim 8, the Office repeats the assertion made in connection with claim 1, namely that

*"The above lines simply state that there is a cylinder data storage system that includes 'tracks' which denote at least 2 constituent storage elements"*

However, claim 8 recites the limitation that the data storage unit is a cylinder and that the data storage elements are tracks of the cylinder.

Thus, in connection with claim 1, the Office regarded the "units" as being the tracks, whereas now, in connection with claim 8, the Office regards the "units" as being cylinders.

In either case, an attempt to map the claim elements to the *Candelaria* disclosure fails because in claim 1, the "elements" of the claimed "data structure" must correspond to whatever the Office regards as the "unit." The Office may not freely interchange "data storage unit" and "data storage element" in the claim as if there was no distinction between them.

Claim 20 recites limitations similar to claim 8 and is patentable for at least the same reasons.

#### **SECTION 102 REJECTION OF CLAIM 11 AND CLAIM 23**

On page 9 of the Office Action, the Office states

*"Column 7, lines 16-18 -- State the following, which shows how the directory cache 'scans' the cache for tracks in an unmodified state"*

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<sup>2</sup> *Candelaria*, col. 7, lines 43-35 "all records of a track image written by the channel program."

As a threshold matter, any disclosure of scanning the cache is irrelevant because the claim recites "scanning said data structure." The "data structure" and the cache are different. A disclosure of scanning a cache is not a disclosure of "scanning said data structure."

The actual passage referred to on page 9 of the Office Action reads as follows:

"The directory entry is a control block which indicates location of a track image in cache and the address in DASD of the unmodified track. If a track image is the subject of a channel command word chaining, it is marked busy."

This text plainly has nothing to do with "scanning said data structure." Therefore, the assertion that *Candelaria* discloses scanning the cache for unmodified tracks is not only irrelevant but apparently incorrect.

Claim 23 recites similar limitations and is patentable for at least the same reasons.

#### SUMMARY

Now pending in this application are claims 1-29, of which claims 1, 13, and 25 are independent. No additional fees are believed to be due in connection with the filing of this response. However, to the extent fees are due, or if a refund is forthcoming, please adjust our deposit account 06-1050.

Respectfully submitted,

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